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**AN ANALYSIS OF COMPONENT BREAKOUT
FOR THE TUBE LAUNCHED OPTICALLY
TRACTED WIRE-GUIDED MISSILE SYSTEM**

by

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December 1995

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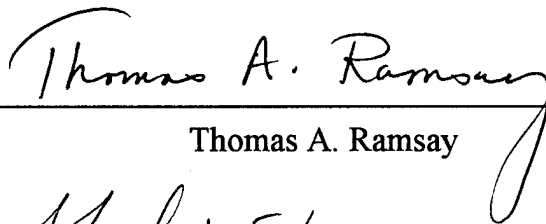
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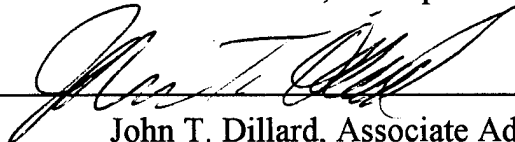


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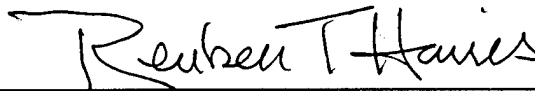
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ABSTRACT

This thesis examines and analyzes the component breakout program for the Tube Launched Optically Tracted Wire-Guided (TOW) Missile System. The advantages and disadvantages of component breakout are addressed, and an analysis of the component breakout process from the TOW Project Office perspective is provided.

The research methodology consisted of a literature review, personal and telephonic interviews, and questionnaire responses of senior military and civilian acquisition personnel.

The conclusions based on this research are: (1) Component breakout is resisted by program managers, (2) Component breakout operates in an environment of competing requirements and interests, (3) Component breakout guidance is sufficient, (4) Component breakout is going to be increasingly difficult to accomplish in the future.

Recommendations of this study include: (1) Ensure that the component breakout strategy is included in the acquisition strategy, (2) Require a risk analysis prior to all breakout decisions, (3) Determine and fund the additional personnel resources required when performing component breakout, (4) Conduct a cost-benefit analysis prior to making a component breakout decision.

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I. INTRODUCTION

A. BACKGROUND

Component breakout is the process of acquiring a weapon system component directly from the original equipment manufacturer (OEM) in order to effect a net cost saving without jeopardizing the quality, reliability, performance, mobilization capability, or timely delivery of the end item. This acquisition may be a sole-source or competitive procurement as appropriate under the circumstances. These components are then provided to the prime contractor as Government-Furnished Equipment (GFE) for integration into an end item. Component breakout can also pertain to a component that is initially produced by a prime contractor as part of a weapon system. In this case the Government has to compete the component in order to develop alternative sources. One of the main objectives of component breakout is to eliminate the weapon system prime contractor as the middleman. The purpose of component breakout is to reduce the overall acquisition cost of the weapon system and develop alternate sources of supply. [Ref. 7:pp. 1-2]

A component is defined in the Defense Federal Acquisition Regulation Supplement (DFARS), Appendix D, as including subsystems, assemblies, subassemblies, and other major elements of an end item; it does not include elements of a relatively small acquisition value. It is important not to confuse component breakout with spare parts breakout. Spare parts breakout is explained in DFARS Appendix E. In spare parts breakout the Government acquires items for use as spare parts to help maintain readiness. In component breakout the Government acquires components to provide to the prime weapon system contractor as

Government-Furnished Equipment for two primary reasons: in order to reduce acquisition costs, and to develop alternate sources of supply.

Department of Defense (DOD) policy pertaining to component breakout is set forth in the DFARS, Appendix D. The current DOD policy is to breakout components of weapon systems or other major end items under the following circumstances:

- (a) When it is anticipated that a prime contract will be awarded without adequate price competition, and the prime contractor is expected to acquire any component without adequate price competition, breakout that component if-
 - (1) Substantial net cost savings probably will be achieved; and
 - (2) Breakout action will not jeopardize the quality, reliability, performance, or timely delivery of the end item.
- (b) Even when either or both the prime contract and the component will be acquired with adequate price competition, consider breakout of the component if substantial net cost savings will result from:
 - (1) Greater quantity acquisitions; and
 - (2) Such factors as improved logistics support (through reduction in varieties of spare parts) and economies in operations and training (through standardization of design).
- (c) Breakout normally is not justified for a component that is not expected to exceed \$1 million for the current year's requirement.
[Ref. 8:pp. D 104-105]

The policy guidance stated above is general in nature which means that each component breakout decision must be considered and analyzed on its individual merits.

B. FOCUS AND SCOPE OF RESEARCH

For purposes of this thesis, component breakout for the Tube Launched Optically Tracked Wire Guided (TOW) Missile System is examined. The TOW weapon system is a crew-portable, vehicle mounted, heavy anti-armor weapon system designed to defeat armored vehicles and other targets such as field fortifications. The TOW weapon system consists mainly of a launcher and any of five missile versions - basic TOW, improved TOW (ITOW), TOW 2, TOW 2A, or TOW 2B. The system, vehicle mounted or crew portable, will operate in all weather conditions in which the gunner can see a target through the missile flight using either the optical (day) sight or the night sight. The tracking and control capabilities of the system provide a high first round hit probability against stationary and moving targets. System accuracy is achieved by the gunner keeping the cross hairs of the sight centered on the image of the target. Any deviation between the gunner's line-of-sight to the target and the flight path of the missile is detected by the sight, processed in the missile guidance set, and transmitted to the missile via the wire command link to correct the flight path and guide the missile to the target.

The focus of this research is to examine and analyze the component breakout process from the TOW Project Office's perspective and the current issues surrounding the component breakout program and process. This thesis evaluates the advantages and disadvantages of component breakout for the TOW missile system and addresses whether component breakout is still a viable/desirable acquisition strategy for the TOW project office. Additionally, it identifies the decision variables that any program manager should evaluate prior to making a component breakout decision.

There have been many difficulties with implementing a breakout strategy for the TOW Missile System and numerous reasons for the difficulties. Some of the most notable difficulties include: additional management burden, hidden costs, logistical considerations, configuration management considerations, production considerations, small business concerns, excessive program risk, and quality control/ manufacturing considerations. These difficulties as well as others are examined to draw conclusions on whether breakout is still a viable cost reduction strategy.

The scope of this thesis is limited to the Army's Program Executive Office, Tactical Missiles. This command is the Headquarters for all tactical missiles within the Army. The research effort is limited to the breakout of components for the TOW Missile System exceeding \$1 million annually, but, does not address high dollar value spare parts.

C. ASSUMPTIONS

This thesis assumes that the reader has an understanding of the concept of breakout as a cost reduction strategy. Although background information is provided as part of this document, the reader will improve his comprehension of the issues presented here by reviewing the Federal Acquisition Regulation (FAR), the DFARS, and the other literature referenced. In addition, the reader is assumed to be familiar with Department of Defense (DOD) systems acquisition processes, terminology, and has an understanding of the role the program manager plays in this process. Furthermore, the reader is assumed to be generally familiar with recent initiatives occurring within the DOD, such as the Defense Management

Review, the Federal Acquisition Streamlining Act, and the Vice President's National Performance Review.

D. RESEARCH QUESTIONS

The primary research question of this study is: Based on the current draw-down, and cutbacks in defense appropriations and in the number of weapon systems, along with a declining industrial base, do the disadvantages of component breakout outweigh the advantages of component breakout, and is component breakout still a feasible and/or desirable cost reduction strategy for the TOW project office?

Specific subsidiary research questions to be addressed in the study are:

1. What are the current regulations, statutes, and other guidance pertaining to the component breakout process?
2. What are the current requirements for component breakout and how is the TOW project office implementing those requirements?
3. What are the problems associated with the component breakout process from the project office perspective?
4. Does component breakout still make sense for the TOW Project Office in a declining business base?

E. RESEARCH METHODOLOGY

Research investigation includes a review of pertinent literature, a questionnaire developed for selected project office and contracting personnel within the Program Executive Office, Tactical Missiles, and personal interviews with both project office and contracting personnel.

The information gathered was analyzed to determine the major difficulties and concerns with breakout procurement from various points of view. The analysis then assessed the advantages and disadvantages of component breakout to determine whether breakout is still economically desirable/ feasible for the TOW project office.

F. THESIS ORGANIZATION

This thesis consists of a comprehensive analysis of the breakout process from the TOW Project Office's perspective. Chapter II describes a history of the DOD breakout program and the current emphasis on component breakout. Chapter III provides the methodology used to evaluate the data. Chapter IV provides the data interpretation and analysis of this study. Chapter V presents conclusions drawn from the research and recommendations for the application of the research results.

II. BACKGROUND

A. INTRODUCTION

The purpose of this chapter is to provide an historical perspective of component breakout and address the current status of the component breakout program. The primary focus is placed on changes in the acquisition environment that significantly shaped the breakout process and the evolution that has taken place in the breakout process since the 1930s.

B. THE HISTORY OF COMPONENT BREAKOUT

During the 1930s component breakout was common. This was mainly due to the simplicity of weapon systems and technology at that time. The Government was able to produce components and provide them directly to the prime contractor. However, as technology continued to increase, the ability of the Government to provide components as Government-Furnished Equipment (GFE) decreased significantly. Weapon systems integration became much more complex and the Government lacked the technical expertise required to effectively manage systems integration. As technology increased it became more and more common for the prime contractor to take over this role as the systems integrator.

[Ref. 14:p. 10]

The role of systems integrator continued to develop during the 1940s. This may be due in part to the explosion of technology that took place during World War II. By the 1950s, defense contractors were performing total weapon systems integration. This gave the

prime contractor additional responsibility for integrating components into a weapon system. This increased responsibility translated into additional risk for the prime contractor and led to additional costs to the Government.

By the late 1950s, this expanded role of the prime contractor was gaining attention in the procurement community. Government procurement managers began to notice that the integration role the prime contractor was performing was also increasing the cost of weapon systems. As the weapon systems developed after WW II began to mature and enter relatively stable production cycles, the Government realized that it could procure components directly from the subcontractor or manufacturer and provide them to the prime contractor as GFE. [Ref. 15:p. 11]

In the late 1950s the Army took the lead in the component breakout effort and began breaking out components for direct procurement and providing them to the prime contractor as GFE. In the Nike-Hercules program alone, the Army reported saving \$11.3 million by breaking out components for direct procurement. The Army's early experience with the component breakout program enjoyed so much success that Congress insisted that the Navy and Air Force establish their own breakout programs. [Ref. 1:p. 33]

During the 1960s Secretary of Defense Robert McNamara directed that component breakout become part of each military Service's acquisition planning process. In addition, requirements were established to acquire technical data packages in order to increase competition during the breakout process. Subsequently, in 1965, the Armed Services Procurement Regulation (ASPR) was amended to include detailed guidelines for implementing component breakout. Throughout the 1960s component breakout increased,

and as a result, millions of dollars in cost savings were realized. However, little attention was given to the additional technical and management burden component breakout placed upon the Government. [Ref. 14:p. 11]

The 1970s saw a lull in component breakout activity. As in WW II when weapon systems and technology became more complex, breakout activity decreased. In addition, many of the acquisition policies and procedures instituted during the 1960s were being challenged in Congress. This, coupled with limited technical expertise and personnel constraints, made component breakout difficult for the program manager to accomplish. These factors may have contributed to the minimum amount of component breakout that took place throughout the military Services in the 1970s even though the regulatory breakout policy from the 1960s was still in effect. [Ref. 14:p. 13]

This reduction in component breakout activity drew considerable attention from various Government audit agencies. Several audit agencies expressed concern over the adequacy of the Service's compliance with DOD's component breakout policy. These agencies, both internal and external to DOD, were reporting that millions of dollars in cost savings were being lost due to the lack of component breakout in new production weapon systems. [Ref. 15:p. 12]

The Army and Air Force Audit Agencies conducted numerous component breakout audits during the mid to late 1970s on various major weapon systems programs.

In 1975, the Army Audit Agency (AAA) conducted an audit of the U.S. Army Aviation Systems Command and the U.S. Army Missile Command. The audits concluded that the commands had not fully implemented component breakout programs and as a result,

were not realizing the potential savings that could be achieved by breaking out components. The report recommended that the Army Material Command place additional emphasis on the monitoring of the various major commands to ensure that to the maximum extent practical, component breakout policies and procedures were being followed. [Ref. 5]

In 1979, based on several Air Force Audit reports, the House Appropriations Committee concluded that:

These audit reports demonstrate that too little attention is being devoted to the component breakout program. The same is probably true of the Army and Navy, although audits of this program in those departments have not come to the attention of this committee. The component breakout program should be applicable across every item of equipment built for the military departments, as well as for spares support purchased for those equipments. Aircraft engines have been a high dollar Government Furnished Equipment item for many years and there is no reason why other engines, fire control systems, navigation systems, and other much smaller components cannot be purchased directly from manufacturers once an end item enters production. [Ref. 21]

As a result of this increased oversight on component breakout and the potential for cost savings, the Secretary of Defense received guidance from Congress to place additional emphasis on the component breakout program. [Ref. 15:p. 13]

At the time these audits were being conducted, the Defense Acquisition Regulation (DAR) contained DOD guidance on component breakout. However, program managers charged with bringing their programs in within cost, schedule, and performance thresholds were reluctant to convert contractor furnished equipment (CFE) to GFE because of the risk involved. [Ref. 15:p. 14] Some of the most notable risks included: production and schedule delays due to late or defective GFE, quality control and quality assurance problems,

configuration management complexity, increased logistical complexity, and managing the system integration effort. These as well as many other risks all contributed to the program manager's reluctance to convert CFE to GFE. In addition, the policy in the DAR with respect to component breakout was being interpreted differently within and among the Services. [Ref. 15:p. 13]

In the 1980's Congress established the Competition Advocate function within the DOD procurement system. The main function of the Competition Advocate was to reduce cost and increase quality through the increased use of competition. The establishment of the Competition Advocate within each Service gave the component breakout program some leverage when dealing with program managers that were reluctant to breakout components because of the increased cost, schedule, and technical risk. However, use of the Competition Advocate to fulfill this role with respect to component breakout was somewhat ineffective since components that are often broken out are procured on a non-competitive basis from the manufacturer. [Ref. 19]

One of the most significant events in component breakout policy occurred on October 30, 1984 with the passage of the Small Business and Federal Procurement Competition Enhancement Act. This Act established within the Small Business Administration (SBA), a breakout procurement representative for each major DOD installation purchasing more than \$150 million in non-commercial items per year. The breakout procurement representative's main objective was to be an advocate for the breakout of items for procurement through the use of full and open competition whenever appropriate. In order to accomplish this objective the breakout representative is authorized to:

- (a) Attend any provisioning conference or similar evaluation session during which determinations are made as to whether requirements are to be procured through other than full and open competition and make recommendations with respect to such requirements to the members of such conference or session.
- (b) Review, at any time, restrictions on competition previously imposed on items through acquisition method coding or similar procedures, and recommend to personnel of the appropriate activity the prompt reevaluation of such limitations.
- (c) Review restrictions on competition arising out of restrictions on the rights of the United States in technical data, and when appropriate, recommend that personnel of appropriate activity initiate a review of the validity of such an asserted restriction.
- (d) Obtain from any governmental source, and make available to personnel of the appropriate activity, unrestricted technical data necessary for the preparation of a competitive solicitation package for any item of supply or service previously procured noncompetitively due to the unavailability of such unrestricted technical data.
- (e) Have access to the unclassified procurement records and other data of the procurement center.
- (f) Receive unsolicited engineering proposals and, when appropriate (i) conduct a value analysis of such proposal to determine whether such proposal, if adopted, will result in lower cost to the United States without substantially impeding legitimate acquisition objectives and forward to personnel of the appropriate activity recommendations with respect to such proposal, or (ii) forward such proposals without analysis to personnel of the activity responsible for reviewing such proposals and who shall furnish the breakout procurement center representative with information regarding the disposition of any such proposal.
- (g) Review the system that accounts for the acquisition and management of technical data within the procurement center to assure that such systems provide the maximum availability and access to data needed for preparation of offers to sell to the United States those supplies to which such data pertain which potential offerors are entitled to receive. [Ref. 20:Sec. 403]

The breakout procurement representative is authorized to appeal a failure to act favorably upon any recommendation made. The appeal must be in writing and decided within 30 days from receipt. This new policy greatly increased the power of the Small Business Administration with respect to breakout procurement. The program manager now had to strongly justify why components could not be broken out in order to reduce overall acquisition cost. [Ref. 20:Sec. 403]

In the mid 1980s component breakout regulations, policies, and guidance remained relatively stable. However, this had little effect on compliance with the component breakout program. An audit report by the DOD Inspector General in May of 1990 determined that component breakout was often ignored as an acquisition strategy on major defense acquisition programs. In addition, the report found that component breakout reviews were often not performed, and when performed, valid breakout opportunities were not pursued. This audit report led to the current component breakout environment within the DOD. [Ref. 9]

C. CURRENT COMPONENT BREAKOUT ENVIRONMENT

An Army Acquisition Executive (AAE) policy letter dated January 14, 1991 delineates the current Army requirements with respect to component breakout:

Program Executive Officer (PEO) and non PEO Major Subordinate Command project managers will develop component breakout plans and follow the DFARS which requires review of major components for direct or competitive procurement when substantial net cost savings can be achieved.

Component breakout makes sense when done without jeopardizing quality, reliability, performance or delivery schedules of an end item. Managers will make sure efforts result in best value decisions and that they are documented.

Managers will discuss component breakout plans in their acquisition strategies and will follow the new guidance to be published in the DOD Instruction 5000.2 and DOD Manual 5000.2. Breakout decisions will be reviewed, updated, and implemented during program execution.

Managers must also take into account the Government Management Cost (GMC) generated by a breakout action. The AMC Competition Advocate's model for GMC associated with component breakout is available to assist in arriving at an economic analysis that will withstand audit scrutiny. [Ref. 4]

The current DOD Instruction 5000.2, Defense Acquisition Policies and Procedures, contains the following guidance with respect to component breakout:

The Acquisition Strategy Report will discuss component breakout plans and will include a rationale justifying the component breakout strategy.

- (a) Component breakout must be considered on every program and should be done when there are significant cost savings, the technical or schedule risk of furnishing government items to the prime contractor is manageable and there are no other overriding Governmental interests (e.g., industrial base considerations).
- (b) In the Acquisition Strategy Report, list components considered for breakout and provide a brief rationale for those where a decision was made not to break out. A decision not to breakout any components must be justified in the Acquisition Strategy Report to include the rationale for not pursuing component breakout. [Ref. 10:p. 5-A-3]

As can be seen from the above guidance, component breakout in the 1990s continues to be looked at as a cost reduction strategy for the program manager to pursue if there is a potential for significant cost savings. This coupled with the increased oversight of the audit communities since the mid 1980s, is likely to place significant pressure on the program manager to fully explore component breakout opportunities. Since 1984, there have been

over 30 major audit reports citing foregone and potential savings with respect to component breakout. [Ref. 15:p. 15]

This suggests that the audit community and program management community are at odds over compliance and implementation of the component breakout program. This conflict may be explained by the role of the auditor versus the role of the program manager. The auditor's main function is to ensure compliance with various regulations and guidance and to identify foregone and potential cost savings. The component breakout program provides an excellent vehicle for the auditor to accomplish that objective. On the other hand, the program manager's main function is to bring his program in on time, on schedule, within performance thresholds, and to mitigate program risks. The component breakout program can result in substantial cost savings, however, the risks of those cost savings can be very difficult to predict and manage.

As previously stated, the program manager must justify any non-breakout decisions. This environment creates a serious dilemma for the program manager in an environment of shrinking defense budgets and personnel reductions. If a decision to breakout a component is made, it is unlikely that the additional personnel required to perform the systems integration effort by the Government will be available due to the current hiring freeze within DOD as well as the on-going reduction in force efforts.

D. HISTORICAL TRENDS IN COMPONENT BREAKOUT

A review of pertinent literature reveals a cyclical trend in component breakout. As technology increased and weapon systems became more complex, component breakout

activity decreased. As technology became more mature, component breakout activity increased. The role of the systems integrator seemed to shift back and forth between the Government and the prime contractor. This may be largely due to the technical expertise required to manage component breakout given the shifts in technology, as well as the program manager's risk adverse mind set. Congressional oversight also may have played a part in the shifts that occurred between industry and the Government with respect to the component breakout program. On a macro level one can observe these same types of changes in policy and oversight for the entire DOD acquisition process during the same time frame. The current DOD environment is shifting back to reduced oversight and greater decision making authority for the program manager. This coupled with increased emphasis on utilization of best commercial practices and streamlining the acquisition process should help the program manager gain more autonomy over how he executes his program.

E. COMPONENT BREAKOUT IN THE FUTURE

As we enter the mid 1990s acquisition reform has taken hold. The Federal Acquisition Regulation (FAR) has been re-written and is currently under-going another major revision. The Federal Acquisition Streamlining Act (FASA) has just been released and is in the process of implementation. The Vice-President's National Performance Review has recently been completed and is likely to make sweeping changes to acquisition policies and procedures. The Secretary of Defense has issued guidance on eliminating military specifications and standards where they are not needed. These initiatives, as well as many

others currently on-going will have a direct impact on the way we do business within DOD and may impact the component breakout program.

The reported abuses that took place in the mid 1980s with stories alluding to \$500 hammers and the \$600 toilet seats have contributed to the significant political pressure that DOD has felt to reduce military budgets. This, coupled with an exploding deficit has ended the era of unlimited resources for military weapon system modernization. This environment has contributed to the large number of audits that the component breakout program has undergone since the mid 1980s. As we enter the 21st century it is likely that these audits will continue to place emphasis on the breakout program as a cost reduction measure as a means to save scarce Defense resources.

F. SUMMARY

Component breakout is and will continue to be a controversial cost reduction strategy. There is no "cookie cutter" approach that can be applied in every component breakout decision. Component breakout decisions can be affected by many factors including political, business, economic, technological, as well as a myriad of other requirements.

This chapter has traced the history of the component breakout program and provided the current regulatory guidance. A cyclical trend in the history of the component breakout program is evident. This cyclical trend will likely continue into the 21st century as technologies explode and mature. In addition, the audit community is likely to continue their efforts to identify quantifiable cost savings in the component breakout program. This

situation will lead to a considerable amount of scrutiny for the component breakout program as we move into the 21st century.

III. METHODOLOGY AND DATA PRESENTATION

A. INTRODUCTION

This chapter describes the research methodology used to answer the primary and subsidiary research questions identified in Chapter I. This chapter also presents the data gathered from the literature review as well as data gathered from interviews conducted with TOW Project Office personnel. It includes a discussion of what led to the decision to pursue component breakout for the TOW missile as well as the current decision making process the TOW Project Office uses to breakout components. The advantages and disadvantages of component breakout is also addressed along with functional area perspectives on component breakout.

B. RESEARCH METHODOLOGY

The research methodology used in this thesis consisted of a literature review of the Defense Logistics Studies Information Exchange (DLSIE), the Defense Technical Information Center (DTIC), and the Naval Postgraduate School Library. In addition, personal and telephonic interviews and questionnaire responses from TOW Project Office personnel involved in the breakout process were utilized.

The objective of the literature search was to examine the current regulatory guidance and identify advantages and disadvantages of component breakout and look at the difficulties in implementing a breakout strategy for the TOW Project Office.

The objective of the questionnaire was to gather specific data to analyze in answering the primary and subsidiary research questions. The questionnaire consisted of fifteen questions which can be found in the Appendix of this thesis. Respondents were asked to provide written responses to the questions based on their experience and the current guidance within the project office. The analysis of the responses to the questionnaire is contained in Chapter IV of this thesis.

The interviews were unstructured and focused on personnel with an understanding of the component breakout process for the TOW missile system. In this regard, the interview base primarily included senior military and civilian personnel within the TOW Project Office in key management positions responsible for implementing and supporting the component breakout program. Interviews were conducted with personnel from functional area branches within the TOW Project Office. These branches include: Program Management, Acquisition Management, Cost, Production Engineering and Manufacturing, Technical Management, Logistics Management, Test and Evaluation, Product Assurance, and Configuration Management.

C. DISCUSSION AND BACKGROUND

The decision to pursue component breakout for the TOW missile system was made during the mid to late 1970s. Three primary factors contributed to this decision. First, component breakout was and continues to be DOD policy. Second, competition was needed to drive the price of the TOW missile system down to reasonable levels. Third, the audit

community was placing pressure on DOD to comply with component breakout policy in order to realize potential cost savings. [Ref. 11]

The evolution of component breakout policy as discussed in Chapter II of this thesis played a significant part in the decision to embark on a component breakout program for the TOW missile system. In the mid to late 1970s, just as the TOW missile system was in the midst of a large production run, the component breakout program was being revitalized within DOD. This shift in emphasis on component breakout policy resulted in increased oversight for the component breakout process and additional pressure to pursue component breakout for the TOW missile system. [Ref. 15:p. 13]

At the same time, Hughes Aircraft Company, the prime contractor for the TOW missile system, was in a sole-source situation and clearly charging more than necessary to make a reasonable profit. This fact further compounded the need to pursue component breakout as a means of reducing costs and developing second sources. Consequently second sources for the missile and launcher were pursued in the 1970s. Chrysler Corporation won the second source contract for the missile and Emerson Corporation, now Esco Corporation, won the second source contract for the launcher. After this initial competition, SBA assumed that the TDPs for individual components were adequate for component breakout. Unfortunately, this was frequently incorrect, and late deliveries and/or poor quality resulted. However, in a few cases costs came down, particularly when competent prime level contractors were involved. [Ref. 11]

The last significant factor that contributed to the decision to pursue component breakout for the TOW missile system was the significant pressure that Congress was placing

on DOD to fully explore component breakout opportunities. Numerous audit reports were claiming that millions of dollars in cost savings were being lost due to the lack of component breakout in new production weapon systems. [Ref. 15:p. 13] In 1975, an audit conducted at the U.S. Army Missile Command concluded that the command had not fully implemented component breakout programs, and as a result, was not realizing the potential savings that could be achieved by breaking out components. [Ref. 5]

D. DECISION PROCESS

The decision to breakout a component is an extremely complex one. When the TOW Project Office makes the decision to breakout a component they use the 12 breakout guidelines set forth in Appendix D of the DFARS. In addition, other considerations are taken into account depending upon each unique situation. The current regulatory guidelines in DFARS, Appendix D, are provided as questions for the program manager to ask prior to making a decision to breakout components. They are as follows:

1. Is the end item contractor likely to do further design or engineering effort on the component?
2. Is a suitable data package available with rights to use it for Government acquisitions?
3. Can any quality control and reliability problems of component breakout be resolved without requiring effort by the end item contractor?
4. Will the component require further technical support? If so does the Government have such support? Or, can the support be obtained from the end item contractor or other source?
5. Will breakout impair logistics support?

6. Will breakout unduly fragment administration, management, or performance of the end item contract?
7. Can breakout be accomplished without jeopardizing delivery requirements of the end item?
8. If a decision is made to breakout a component, can advance acquisition funds be made available to provide the new source any necessary additional lead time?
9. Is there a source other than the present manufacturer capable of supplying the component?
10. Has the component been acquired directly by the Government as a support item in the supply system or as Government-furnished equipment in other end items?
11. Will the financial risks and other responsibilities assumed by the Government after breakout be acceptable?
12. Will breakout result in substantial net cost savings? Develop estimates of probable savings in cost of requirements determinations and control, contracting, contract administration, data package purchase, material inspection, qualification or preproduction testing, ground support and test equipment, transportation, security, storage, distribution, and technical support. [Ref. 8:pp. D 104-105]

The above decision process is a good starting point to examine whether to breakout a component or not. However, the process is much more involved than simply following the decision process. The advantages and disadvantages of each situation must be assessed.

E. ADVANTAGES OF COMPONENT BREAKOUT

The TOW Project Office has experienced several advantages and disadvantages with respect to component breakout. The advantages and disadvantages cited in the following

sections are based on the interviews conducted with TOW Project Office personnel. Some of the most notable advantages include:

1. Reduced Procurement Cost

One of the main advantages that the TOW Project Office enjoyed by breaking out components was reduced costs of procurement by eliminating the prime contractor's costs of managing the procurement of the components. In addition, the TOW Project Office achieved cost savings by competing components previously purchased by prime contractors from sole-source subcontractors. By breaking out components for competition, the TOW Project Office avoided the prime contractor's middle-man charges. Furthermore, the TOW Project Office was in a position to negotiate lower prices with these subcontractors because of its access to cost and pricing data.

2. Supports Small Disadvantaged Business Concerns

The use of the breakout procurement enabled the TOW Project Office to ensure that contracts would be awarded to small disadvantaged businesses. Although the prime contractor has certain small/small disadvantaged business goals with respect to set-asides there is no guarantee that the prime contractor will meet these goals. Since the TOW missile and its related components are in production, small businesses can make ideal suppliers. Many times small businesses have more advanced manufacturing facilities than their larger competitors. Since the TOW missile system is mature, the technical data package is relatively stable which makes breakout easier for certain components that have relatively simple designs.

3. Increases Competition

As has already been mentioned, when a decision to breakout a component is made, the forces of competition can take over under the right circumstances. This results in an overall lower price to the Government which is the main goal of component breakout.

4. Helps Maintain a Broader Industrial Base

The TOW Project Office through the use of breakout was able to develop alternative sources of supply. In the case of mobilization or national emergency the TOW Project Office has a number of qualified suppliers that can provide components for the TOW missile system. In addition, if a strike or some type of natural disaster occurs, the original manufacturer may not be able to procure components needed to keep the production line running if only one source exists.

5. Increased Technical Expertise of Project Office Personnel

The opportunity for the TOW Project Office to maintain a higher level of technical expertise by managing the technical data package is another benefit of breakout. When conflicts occur, such as the recent one in Somalia, the TOW Project Office is able to respond with technically competent personnel from both the Government and industry. If problems with the TOW missile occur during conflicts such as these, it is critical to have the technical expertise within the project office to solve these problems as quickly as possible to reduce the backlash from the host country and Congress.

6. Standardization

There is an increased potential for standardization in some breakout procurements since the TOW Project Office is managing the Government-Furnished Equipment (GFE).

This can translate into lower life cycle costs through enhanced logistical support, improved reliability, improved availability, better maintainability and enhanced interoperability. Interoperability is particularly important for the TOW missile since a number of our allies have purchased the TOW missile through the Foreign Military Sales program.

F. DISADVANTAGES OF COMPONENT BREAKOUT

Although the TOW Project Office has experienced the advantages listed above, it has also had to deal with the negative aspects or disadvantages of component breakout. Following is a discussion of the primary disadvantages of component breakout:

1. Systems Integration

One of the most significant costs of component breakout is the effort required to act as the system integrator for a weapon system that has numerous components broken out such as the TOW Missile System. When the Government becomes the system integrator it assumes responsibility for on-time delivery, functional performance, and the technical interfaces required by each component to make the entire system function as intended. Acting as a system integrator takes intensive management and expertise. Government management includes much more than just development and production. Fielding, maintenance, replenishment spares, safety, surveillance, modifications, inspections, and testing are a few examples of the roles the Government assumes when it becomes the system integrator. Many times project offices are not properly staffed to perform this critical role. In addition, systems integration adds complexity to the logistical implications already

mentioned, and if not performed properly, can lead to significant cost growth for a project office.

2. Additional Management Burden

The issue of management burden can be looked at from several different perspectives. Since personnel are required to overcome all the issues discussed in this thesis, they are involved in virtually every aspect of the process.

The main issue with personnel is the fact that the additional management responsibility the breakout process places on them is often overlooked or not fully taken into account when the decision to breakout a component is made. Personnel staffing levels and experience are key if the Government is going to effectively manage component breakout.

Government personnel are used to the saying that "they are going to have to do the job with less". This statement is probably true given the current draw-down and the inefficiency with which many Government agencies operate. However, when the decision to breakout a component is made a decision to assess the adequacy of the staffing levels should also be made. The TOW Project Office has experienced a continual reduction in its workforce over the last five years. The increased management oversight required to effectively manage a breakout program does not exist in the project office or in other activities required to support the acquisition of the TOW missile system. This trend is likely to continue in the future based upon the current draw-down and manpower freezes in effect. The bottom line is that the TOW Project Office is not properly staffed to conduct any extensive breakout procurement due to personnel constraints.

3. Source Selection and Negotiation Process

The Government's source selection and negotiation process is a manpower and time intensive undertaking. This process may or may not be required depending upon the circumstances of the procurement. However, in cases where it is required the costs can be substantial. Solicitations must be written and reviewed for all procurements. A source selection plan may be required. A Source Selection Board may have to be established. Contractor's proposals must be evaluated and negotiations must be conducted. Debriefing of unsuccessful offerors also takes time and resources. The possibility of an unsuccessful offeror protesting the award of the contract also must be considered.

The above factors are only representative of the major areas under the source selection and negotiation process. There are many other areas and issues that also take time and resources to accomplish.

4. Contract Administration

Perhaps the most often overlooked cost of component breakout is the contract administration costs associated with component breakout. These costs include writing and administering the contract and the day-to-day management required to ensure that the Government is getting what it contracted for. This may include issuing changes or just providing clarification to the contractor performing the contract.

Interfacing with the contractor, and in the case of small businesses, the Small Business Administration, adds additional workload on contracting personnel. In addition, many times contractors are unfamiliar with Government procedures which can often lead to problems requiring the attention of contracting personnel. Another issue is the cost of

terminating contractors for default. When necessary this action requires an extensive amount of contract administration and is very time consuming.

5. Data Rights/Technical Data Preparation

All contracts require data to be produced, furnished, acquired or specifically used in order to meet contract requirements. It is critical for the Government to spell out in each contract whether it requires limited rights, restricted rights, or unlimited rights to the data. [Ref. 12]

Failure to acquire the appropriate data rights initially, can lead to the Government paying excessive prices for the data rights in the future. At the same time, the Government realizes that contractors have a legitimate interest in protecting proprietary information so they can maintain their competitive edge. Contractors are very reluctant to give up certain data rights for the above reason. Therefore, it is very expensive for the Government to acquire certain data rights from contractors. The costs of acquiring the data rights must be weighed against the benefits.

It is necessary for the Government to acquire data rights when a component is broken out. This can be very expensive as described above. Additionally, it does not guarantee success. Even with a level 3 Technical Data Package, contractors often have difficulty building components for a number of reasons. One of the main reasons is the trade secrets not documented in the Technical Data Package that are a necessary part of the process of building a component. [Ref. 2] This can lead to a number of issues such as schedule or quality problems that will be addressed later in this thesis.

6. Logistical Considerations

Logistics is a broad discipline that covers many areas within weapon systems acquisition. It involves getting the right equipment or material, to the right place, at the right time. Logistical considerations can impact schedule, cost, performance, and readiness, as well as every functional area within a Program Office. When a decision is made to breakout a component, the implications with respect to the above considerations must be assessed. This has to start at the initial planning process. The breakout strategy for a weapon system should be incorporated into the acquisition plan to reduce the risk of experiencing logistical problems in the execution of the program. This takes an extensive amount of planning and foresight.

Component breakout adds to the complexity of logistical planning, and if not accomplished properly, leads to numerous problems in fielding a weapon system on time and within budget. Logistical considerations are becoming more and more important in weapon systems acquisition and must be evaluated prior to making a decision to breakout a component.

7. Configuration Management

Configuration management is somewhat related to logistics. When dealing with a configuration management issue, it is essential to look at ensuring standardization of components provided by suppliers. Mr. George Collier, Branch Chief for the Logistics Management Division of the TOW Project Office, stated that he has never seen a small/small disadvantaged business build an item without a change to the level 3 technical data package. [Ref. 2] This creates a very difficult situation when trying to control the configuration of a

component. During the configuration control process, it is difficult to control changes submitted by the prime contractor. When dealing with a number of other contractors, the task almost becomes impossible.

8. Production Considerations

Scheduling takes on extreme importance when the decision to breakout a component is made. The main reason for this is the fact that production may be delayed if the component being produced is defective or late.

The TOW Project Office has experienced numerous problems with delays in production resulting from problems with breakout. In an analysis conducted to decide whether to breakout the TOW 2B missile components, a team examined historical data on problems encountered with breakout. The analysis determined that the TOW Project Office had incurred costs of \$7.7 million due to late delivery and discrepant hardware over a period of 5 years. The study concluded that if the TOW 2B missile components are broken out, an additional \$21.9 million could be at risk due to potential risks and problems with breakout. [Ref. 6:pp. 1-7] As can be seen from the above figures, problems with breakout can be extremely costly to a project office.

According to Mr. Jerry Green, Chief of the Acquisition Management Branch for the Close Combat Anti-Armor Weapon System (CCAWS) Project Office, when the decision to breakout a component is made, the project office doubles production lead time because of additional requirements such as First Article Testing, and logistical considerations. [Ref. 13]

9. Small Business Concerns

The ability of the TOW Project Office to manage small businesses is extremely limited. As already mentioned, small businesses have a difficult time delivering components without a change to the technical data package. In addition, small businesses often do not offer the lowest price to the Government. This coupled with the additional management burden required makes utilizing a small business a painful process for Government personnel. With shrinking defense budgets the feasibility/desirability of utilizing small businesses becomes less and less attractive to the program manager.

10. Testing Considerations

An additional consideration is how to test components with Built In Test (BIT) and Built In Test Equipment when you have numerous configurations manufactured by different suppliers. The test equipment that supports BIT and BITE is designed for the original configuration. By introducing additional configurations it becomes difficult to ensure that the appropriate test and diagnostics equipment will fault isolate the problem with the component.

11. First Article Testing

When the decision is made to breakout a component, the contractor will be required to perform a First Article Test to ensure the component meets requirements. If the component fails First Article Testing, it can directly impact on the production schedule resulting in late GFE to the prime contractor. In addition, the Government has to pay for the cost of the First Article Test which is an additional cost to consider. These added costs can be significant depending on the situation.

A slip in production can lead to severe cost growth in a program and degraded readiness. Additionally, if the new contractor fails First Article Testing and the prior producer of the component is no longer in production, a gap in the industrial base is created. This situation can be avoided by having options in the contract with the systems contractor to produce the component. [Ref. 13]

12. Excessive Program Risk

Excessive program risk is related to virtually every disadvantage associated with breakout. The most common program risk is associated with late and defective GFE. As already discussed, this issue cost the TOW Project Office \$7.7 million over a 5 year period. [Ref. 6:p. 5] The costs for a schedule delay is most often passed on to the Government in the form of a request for equitable adjustment or simply by filing a claim.

In cases where the production is already behind schedule, it may be difficult for the Government to prove that late GFE did not contribute to the production delay. This could result in the Government paying for problems the prime contractor was experiencing due to no fault of the Government.

The above issues may help explain why so many program managers are adverse to breakout. One of the primary jobs of the program manager is to manage risk. One way to manage risk is simply to avoid it.

13. Quality Control/Manufacturing Considerations

The issue of quality is also a factor that should be considered when breaking out a component. The Government must certify all new suppliers. This can be a costly and time consuming effort. This certification process in many cases will require training of the new

suppliers in various QA/QC techniques. The supplier also has a learning curve that has to be considered. In addition, the supplier may encounter many of the same problems the original equipment manufacturer experienced when first building the component.

Many companies also have closely held trade secrets that they acquired during the manufacturing process. These trade secrets can significantly contribute to the quality of a component. However, these trade secrets are not part of the technical data package provided to the new supplier. This can result in components being built that do not function as intended. The TOW Project Office has experienced problems with providing defective GFE to Prime Contractors. When the Government provides a technical data package to a contractor to build a component, the Government assumes liability if that component is built in accordance with the technical data package and fails to work. The main reason for this is that the Government owns the technical data package and is responsible for its accuracy. The supplier also has a learning curve that has to be considered. The supplier may encounter many of the problems the original manufacturer experienced when first building the component.

14. Component Complexity Considerations

The more complex a component is the more difficult it is to breakout. When dealing with certain complex electronic components contained in the TOW missile system, a decision to breakout those components is unwise. The TOW Project Office utilizes this principle. The less complex components of the TOW missile system are often selected for breakout.

15. Performance Specification Issues

With the new policy issued by the Secretary of Defense with respect to performance specifications, it is unclear how the TOW Project Office will implement a breakout strategy. This will make standardization much more difficult to achieve because of the latitude given to suppliers in meeting the requirements. In addition, it may make configuration management an even more complex undertaking.

16. Readiness

Readiness is becoming more and more important in weapon systems acquisition. The TOW missile is no exception to this rule. Although this thesis is not focusing on spare parts, it is essential to mention that having insufficient spares can greatly affect readiness. Item managers at the Integrated Material Management Center (IMMC) at the U.S. Army Missile Command (MICOM), stated that if they have zero stock of a particular spare, a decision should be made not to breakout the component because of the effect it can have on readiness if a problem occurs in the procurement of that component.

Indeed breakout does place a tremendous risk on the Government and our soldiers in the field if not thought out properly. Breakout requires extensive management of numerous logistical situations to ensure that readiness is not affected in a negative way.

17. Warranty Coverage

The term warranty is defined in the Federal Acquisition Regulation (FAR) as:

A promise or affirmation given by a contractor to the Government regarding the nature, usefulness, or condition of the supplies or performance of services under the contract.

- (a) The principal purposes of a warranty in a Government contract are (1) to delineate the rights and obligations of the contractor and the Government for defective items and services and (2) to foster quality performance.
- (b) Generally, a warranty should provide-
 - (1) A contractual right for the correction of defects notwithstanding any other requirements of the contract pertaining to acceptance of the supplies or services by the Government; and
 - (2) A stated period of time or use, or the occurrence of a specified event, after acceptance by the Government to assert a contractual right for the correction of defects.
- (c) The benefits to be derived from a warranty must be commensurate with the cost of the warranty to the Government. [Ref. 11:pp. 31, 191]

A comprehensive warranty definition is:

A legally binding guarantee usually explicit, but in certain cases implicit whereby a contractor, with or without an explicit payment, agrees to remedy defects in design, manufacture, workmanship, materials, or performance existing at a specific time or emerging over a specific period in a weapon system. It may in addition, provide positive incentives to exceed target specifications in these characteristics, or penalties if specific targets are not achieved. [Ref. 3:p. 2-1]

When component breakout is chosen as a acquisition strategy, a major issue becomes:

How does the Government enforce the warranty of the end item? When a component is broken out, it eventually becomes part of the end item. In the case of the TOW missile, components are integrated into the missile system. If a failure occurs with the missile system, it can be very difficult to isolate the fault to a particular component. This makes

enforcing warranty provisions with the prime contractor very difficult. The prime contractor may claim that a Government-furnished component caused the failure in the system.

Another issue involves the shelf life of the TOW missile system. The TOW missile has an approximately twenty year shelf life. When the missile is taken out of storage for use in combat, it is expected to work. Most, if not all, warranties expire long before the missile will ever be fired. An exception to this is latent defects that were not detected during the inspection and acceptance process. In the case of latent defects, the Government can hold the contractor liable for problems with the missile. When the missile contains components that were broken out, the issue of responsibility for failure becomes hard to pinpoint.

A final issue that affects warranties when breakout is chosen as an acquisition strategy is dealing with Government-Owned Contractor-Operated (GOCO) operations. In the case of the TOW Missile, the launch motor is built by Radford Army Ammunition Plant, and the warhead is built by Iowa Army Ammunition Plant, both of which are GOCO operations. Implementing a warranty with either of these operations would amount to the Government having a warranty with itself.

18. Non-Recurring Costs

The decision to break out a component must also include non-recurring costs that will be incurred in order to establish a second source for the component. Non-recurring costs that should be debited against any savings achieved by breaking out a component include production tooling and test equipment required for the second source as well as any other cost that is a one time expense to the current producer. The failure to separate out non-recurring costs involved with both the development and production of the system artificially

inflates early price levels and distorts the actual savings achieved by breaking out a component. [Ref. 17]

G. FUNCTIONAL PERSPECTIVES

1. Project Office Perspective

From the project office perspective breakout increases program risk and creates an additional management burden upon project office personnel. In addition, the project office is not adequately staffed to effectively manage breakout. Since one of the program manager's primary functions is to reduce program risk, implementing a breakout strategy conflicts with this goal. The TOW Project Office has experienced many of these risks first hand. Cost growth, termination for default, defective GFE, late delivery of GFE, and additional contract administration burden are some of the more common problems the TOW Project Office had to contend with while managing the overall program. In today's environment, no project office can survive these types of problems without increasing their chance for project cancellation. The general consensus among TOW Project Office personnel was that the disadvantages of component breakout far outweigh the potential benefits.

2. Socio-Economic Perspective

From the small/small disadvantaged business perspective, the breakout program gives small businesses opportunities that they would not have otherwise. Breakout increases competition and allows the Government to develop alternative sources of supply. In

addition, breakout increases the industrial base by spreading the work among small businesses.

A champion of the small/small disadvantaged business perspective can be found in the Small Business Administration (SBA) breakout procurement representative. According to Mr. Ralph Massey, Breakout Procurement Representative for MICOM, there is a mind-set among program managers of total avoidance of risk whenever possible. [Ref. 16] If program managers can totally avoid the risk, they do not have to manage it. This creates a big challenge for the SBA since their charter is to guard the interest of small businesses.

3. Advocacy and Oversight Perspective

From the advocacy and oversight perspective, although the DFARS is the current Defense guidance, each Service implements breakout in a different manner. There is a consensus in the literature reviewed that standardization is needed among the Services.

H. CONCLUSION

This chapter presented the methodology employed by the researcher to accomplish the research objective. A brief background of what led to the decision to pursue component breakout for the TOW Project Office was presented as well as the current decision process the TOW Project Office uses when breaking out components. Also included in this chapter was a discussion of the advantages and disadvantages associated with component breakout.

IV. DATA INTERPRETATION AND ANALYSIS

A. GENERAL

This chapter contains the research findings resulting from the data collected by the researcher using the methodology outlined in Chapter III. It contains the interpretation and analysis of the responses from the questionnaire described in Chapter III and concludes with a brief summary of the analysis.

B. TARGET AUDIENCE

Questionnaires were sent to 20 personnel within the TOW Project Office who were experienced with the component breakout process. In this regard, the questionnaire base primarily consisted of senior military and civilian personnel. These personnel, on average, had more than 20 years experience in Program Management and Contracting. Replies were received by 15 officials for a seventy-five percent response rate.

C. THE QUESTIONNAIRE

The questionnaire was designed to solicit the opinion of respondents concerning the component breakout process. The objective of the questionnaire was to gather specific data to analyze and answer the primary and subsidiary research questions identified in Chapter I.

I. All questions required written opinions or statements from the respondents based on their experience with respect to component breakout for the TOW missile.

D. ANALYSIS

1. Question 1

Are there certain systems or components that have been easier to breakout than others?

Interpretation and Analysis of Responses

Responses were received from 15 interviewees. One-hundred percent indicated that certain components are easier to breakout than others.

The responses all indicated that component breakout is easier to accomplish on items with stable designs, and mature technical data packages. In addition, respondents indicated that mechanical and simple optical parts and assemblies with minimal design complexity are easier to breakout because they lend themselves to a better technical description. In cases such as this, performance is easier to measure and verify compared to complex electronics/electro-optics.

The data clearly indicate that these individuals are all in agreement on the fact that certain components are easier to breakout than others. A common thread that exists in the responses is simplicity and stability of design of a component is a critical factor in the component breakout decision process. Another key factor is a mature technical data package that will support the resolution of any problems in the quality or reliability of the component. Under these circumstances, component breakout should be accepted as an means to acquire components.

2. Question 2

What process does the project office use to assess the desirability/feasibility of breaking out a component?

Interpretation and Analysis of Responses

Responses were received from 15 interviewees. The respondent group as a whole had several consistent observations.

The TOW Project Office utilizes the knowledge and experience base of the Project Office and the matrix activities which support their mission. These activities include: the MICOM Acquisition Center, the Research Development and Engineering Center, the Product Assurance Directorate, the Systems Engineering and Production Directorate, the Integrated Material Management Directorate, the Resource Management Directorate, the Small and Small Disadvantaged Business Utilization Office, the Competition Advocate, as well as many other organizations within the MICOM community.

The initial review for any potential component breakout decision begins with the engineering and manufacturing phase and remains a consideration through the completion of the production phase. The project office uses the criteria set forth by the DFARS in Appendix D as well a formal system analysis to determine the desirability of utilizing component breakout.

In general, the data indicate that an analysis of technical stability, complexity, cost saving, technical data package, risk of degrading performance and reliability, risk of production stop, stable out year requirements, and ability to plan, should be assessed in order to make an informed decision about the desirability or feasibility of component breakout.

The responses seem to indicate that the project office is well aware of the requirements outlined in DFARS Appendix D and has a disciplined process in place to assess the desirability of component breakout. In addition, it is clear that the respondents were well aware of the problems with embarking on component breakout without a clear well thought out breakout plan. The data indicated that the TOW Project Office currently uses factors beyond what is called for in the DFARS in order to avoid costly component breakout mistakes.

3. Question 3

What criteria are used to determine if a component should be broken out?

Interpretation and Analysis of Responses

Responses to this question were received from 13 interviewees. Sixty-one percent indicated that the ability of small businesses to build the component, coupled with the criticality of the component, and the procurement lead time required are the criteria utilized to determine if a component should be broken out. In addition, these respondents indicated that the results of the assessment of the desirability and feasibility of component breakout identified in Question 2 is also a key criteria. Thirty percent answered that sometimes the criteria are political and breakout is forced upon the program.

There were two individuals that did not comment on the criteria used to determine if a component should be broken out.

The data seem to indicate that there is a general consensus among the project office personnel as to the criteria that should be considered prior to making a component breakout

decision. The criteria identified by the respondents are consistent with the guidance contained in the DFARS.

It is interesting to note that thirty percent of respondents felt that the criteria are sometimes political in nature. This may be due to a number of reasons. First, the Government procurement system is inherently political because of the Congressional oversight required when spending public funds. Second, the component breakout process does result in small and small disadvantaged businesses being awarded contracts that they might not otherwise receive as a result of various laws and regulations. Third, the Government does have certain small business threshold goals that they must meet when awarding contracts. The above reasons, as well as others, may help explain why the respondents felt that the component breakout process is political in nature.

4. Question 4

What is the most difficult aspect of the component breakout process from the project office perspective?

Interpretation and Analysis of Responses

Sixty percent responded that time constraints, interface requirements in the systems integration effort, and risk are the most difficult aspects of component breakout. Twenty-seven percent indicated that the constantly changing budgetary position of the Army is the most difficult aspect of implementing a component breakout program. Thirteen percent had no comment on this question.

The basis for these responses is that the component breakout program requires close management to be effective. Procurement lead-time when component breakout is chosen as

an acquisition strategy becomes critical. If components that are broken out are not received in the required time frame, a stop in production can result. The systems engineering effort also is a complex process with component breakout. As part of the systems engineering process, ensuring component interfaces match system requirements and work as intended, also adds complexity to the process. These risks coupled with a constantly changing budget can make it extremely difficult to plan for an effective component breakout program.

It is apparent from the data that component breakout can be difficult for the Program Management team to perform. Issues such as procurement lead-time, systems integration, and managing risk are just a few of the difficult aspects of component breakout. In addition, an ever changing budgetary climate adds to the uncertainty of the process by making effective planning extremely difficult. In order to manage these difficulties, and make informed decisions on component breakout, program managers should assess each breakout decision against these difficulties to determine if component breakout will have an adverse effect on cost, schedule or performance of their program.

5. Question 5

What external agencies does the project office have to deal with when breaking out components? What are the main difficulties of working with these agencies?

Interpretation and Analysis of Responses

Fifty-three percent responded that the Competition Advocate and the Small Business Administration were the main external agencies that they had to deal with. Forty-seven percent responded that the project office works with the matrix support organization when breaking out components.

These responses were mixed but can be categorized into two main groups. The personnel that indicated they dealt with the Small Business Administration and Competition Advocate stated that they had experienced difficulties when working with these agencies. On the other hand, the personnel that worked with the matrix personnel did not mention any difficulties working with personnel from these groups.

The data indicate that the Competition Advocate, and the Small Business Administration have their own agendas and goals that may or may not match the goals of the project office. These goals include enhancing competition and assisting in the development of small businesses through the various socio-economic programs. While these goals are noteworthy, they can sometimes conflict with the goals of the program office. Understanding these differences, and making the right decision is key to maintaining both parties' interests. Both the project office and these agencies should be in agreement on whether a company should be certified to produce a component. For example, when the Small Business Administration gives a Certificate of Competency to a small business that the project office does not feel deserves one, an immediate conflict exists. These types of decisions should be supported by all parties concerned so that the component breakout process can be effectively implemented.

6. Question 6

Has the project office implemented any unique breakout techniques that have enhanced the breakout process? If so, please specify what they are.

Interpretation and Analysis of Responses

Eighty percent responded that they were not aware of any unique breakout techniques. Twenty percent indicated that the project office had utilized innovative or unique breakout techniques.

With the number of years of experience represented by the interviewees in this thesis, it is interesting that so few were aware of the unique techniques the project office had implemented to enhance the breakout process. It was equally interesting to note that the unique techniques identified by a small number of respondents were all contracting methods designed to give the project office flexibility. These methods involved awarding a contract to a known producer of a component and including options in the contract. The contract awarded covered the time required to get a breakout contract awarded, first article test completed, and production lead time. The option in the original contract would only be used if the breakout contractor failed first article testing or could not meet production deliveries.

The data indicate that the project office as a whole is not aware of the unique techniques that have been utilized to enhance the component breakout process. The contracting personnel within the project office were the only ones aware of the contracting methods utilized to enhance the component breakout process. In order for component breakout to be effective, contracting and program management have to work together.

7. Question 7

Is the breakout process becoming more difficult or easier to accomplish and why?

Interpretation and Analysis of Responses

Sixty-six percent indicated that breakout is becoming more difficult. Twenty-seven percent expressed that breakout is becoming easier. Seven percent indicated that conditions for implementing breakout had not changed.

The majority of responses indicated that breakout is becoming increasingly difficult to accomplish because of the elimination of specifications and standards. Respondents also indicated that there will be less business with the traditional "build to print" shops. In addition, the complexity of today's weapon systems requires engineering capabilities beyond many small businesses' abilities. All of these factors have the potential to limit breakout opportunities for the project office.

The data make it clear that breakout is becoming more difficult to accomplish. In general, the responses indicated that the elimination of specifications and standards coupled with the complexity of modern weapon systems limits breakout opportunities for the future. In addition, a declining defense budget has many prime contractors fighting to keep as much defense work in house as possible. Another potential factor is the reduced quantities of weapon systems that the DOD is buying. With smaller production runs, many times it does not make economic sense to utilize component breakout as an acquisition strategy.

8. Question 8

What are the decision variables that you think are key to a successful component breakout? List the top 10 variables in descending order of importance.

Interpretation and Analysis of Responses

This question was asked to provide the program manager with a list of decision variables that can assist in the component breakout decision making process. Listed below are the top 10 decision variables given by the respondents:

1. Mature and Stable TDP.
2. Component Design Complexity.
3. Program Stability.
4. Technical Expertise of Contractor.
5. Technical Expertise of Government.
6. Competitive Market Place.
7. Cost Savings.
8. Staffing Level of Government.
9. Quantity of Components Needed.
10. Past Performance of Contractors on "like" items.

The above responses are listed in descending order of importance. These decision variables can be a useful tool for the program management team in assessing the desirability of component breakout. The responses overwhelmingly indicated that a mature and stable TDP, component complexity, and program stability are the top variables that are key to a successful component breakout program.

The data indicate that the component breakout process can benefit by an analysis of the decision variables identified above. The analysis must provide a convincing basis to support the decision of whether or not to pursue component breakout.

The variables identified are by no means conclusive. However, they are factors that should be considered during the decision process. The data clearly indicate that a stable and mature TDP is the most important factor to consider when making a decision to breakout a component. However, factors other than the variables identified also impact the component breakout decision. Political influences, combined with stringent regulations, dictate that the program manager must consider socio-economic programs. These influences must be dealt with to ensure that the analysis is the primary factor that determines whether to pursue component breakout.

9. Question 9

What are the positive and negative impacts of component breakout for the project office?

Interpretation and Analysis of Responses

Eighty percent indicated that reduced cost was the positive impact of component breakout. Twenty percent stated that increased competition was the positive impact. Seventy-three percent indicated that late delivery of components was the negative impact. Twenty-seven percent stated that quality concerns was a negative impact.

The data indicate that cost savings versus risk to the program are the main positive and negative impacts respectively. It seems clear from these responses that a cost-benefit analysis should be required to assess the potential cost savings of component breakout

compared to the risk required to achieve these savings. Late receipt of a component required for production can quickly negate any cost savings achieved.

It is apparent that cost-benefit analyses could support the component breakout decision process. A quantitative assessment of benefits in the form of reduced costs compared against the associated risk to the program for late or defective GFE could enable the program manager to make an informed business decision for his program.

10. Question 10

Is the project office experiencing an increase or decrease in component breakout?
What is the reason for this increase or decrease?

Interpretation and Analysis of Responses

One-hundred percent responded that the project office is experiencing a decrease in component breakout because the TOW missile is near the end of the production phase. The project office is currently working several new programs in the engineering and manufacturing development phase. In this phase of the acquisition process there is generally less opportunity for component breakout because a TDP does not exist.

The data clearly indicate that the project office is conducting less component breakout. This is due to a number of reasons. First, the TOW missile is nearing the end of the production phase with smaller quantities being procured. Second, the downsizing that has been implemented throughout DOD is also reducing quantity requirements. Third, the project office is in an engineering and manufacturing development mode with new systems which limits component breakout opportunities. All of these factors, as well as others reduce the business base that exists for potential component breakout contractors. The smaller

procurement quantities makes component breakout less cost effective because the cost savings achieved are off set by the start up costs for the breakout contractor.

11. Question 11

Do you think that the Competition Advocate and the Small Business Administration is an asset or a liability to the project office when it comes to component breakout?

Interpretation and Analysis of Responses

Seventy-three percent responded that these organizations are assets to the project office. Twenty-seven percent stated that they were liabilities to the project office.

The basis for these responses are that depending on the circumstances of the procurement these organizations can be both an asset and a liability.

These organizations have goals that are common to the project office and goals that can and sometimes do conflict with the project office. Getting these organizations involved in the component breakout planning process early can strengthen the relationship that exists between the project office and these organizations.

The data confirm that common ground exists between these organizations and the project office. However, they also confirm that these organizations and the project office have competing goals and priorities that must be managed to ensure the right component breakout decision is made. The component breakout process operates in an environment of competing priorities within the acquisition system. Managing these priorities is key to a successful component breakout program.

12. Question 12

From a personnel and technical perspective, is the project office properly staffed to perform the systems integration role required when components are broken out?

Interpretation and Analysis of Responses

Respondents were split down the middle on this question. Fifty-three percent indicated that the project office is not properly staffed to perform the systems integration role. Forty-seven percent stated that the project office does have adequate resources to perform this role.

Respondents that stated the project office was not properly staffed thought that the down sizing had adversely affected their ability to perform the systems integration role. Respondents that stated that the project office had adequate resources thought that support by the matrix organizations was sufficient to perform this role. Although, these responses were mixed, respondents generally agreed that an unstable TDP and on-going design changes significantly impacted the project office's ability to perform the systems integration role.

Many respondents thought that the skills to perform the systems integration role within the project office was disappearing with the push to smaller more streamlined project offices.

It is apparent that component breakout places additional responsibilities on the project office. Whether a project office is properly staffed to perform the systems integration role depends on each situation. In the past, when project offices were larger, the skills required to perform the systems integration role were generally available. With the move to smaller project offices, many of these skills have disappeared. In today's environment

there is a push to let the prime contractor perform the systems integration role. If this trend continues, breakout activity will decrease significantly and the resident skills within the project offices are likely to diminish further.

13. Question 13

Who should make the component breakout decision? Should a project manager ever be forced to breakout a component? If so, by whom?

Interpretation and Analysis of Responses

One-hundred percent responded that a program manager should make the component breakout decision. Respondents indicated that a program manager should not be forced to breakout components. However, if a case for component breakout exists, the SBA and Competition Advocate should put pressure on the program manager to explore component breakout opportunities. Respondents overwhelmingly indicated that the program manager is in the best position to assess the impact component breakout may have on his program.

The intent of the component breakout program is to reduce the acquisition cost of a weapon system by pursuing component breakout opportunities. The program manager, by virtue of his role is in the best position to evaluate potential breakout opportunities in order to meet that intent.

The respondents stated that pressure should be applied to ensure that the program managers consider component breakout opportunities. However, the respondents also think that the decision the program manager makes with respect to component breakout should be final. If a program manager is forced to pursue component breakout for political or socio-economic reasons the entire program is likely to suffer.

14. Question 14

Do you think there is adequate policy guidance within the DOD, DA, and/or the project office concerning component breakout?

Interpretation Analysis of Responses

Eighty-six percent responded that there is adequate policy guidance throughout the process. Seven percent stated that there was too much guidance and seven percent stated that there was not enough guidance.

It is clear from these responses that most felt there was adequate guidance on the component breakout process. These responses are confirmed by the extensive guidance found in the literature. Policy guidance has continued to evolve and is frequently supplemented by local commands.

In general, the responses indicated that policy guidance is adequate. However, a careful reading of the responses indicates that although there is sufficient policy guidance within DOD on component breakout, the guidance often contradicts other policies within DOD. For example, on the one hand there is pressure to pursue component breakout. But, on the other hand there is pressure to streamline the acquisition process and depend more on the prime contractor. These philosophies are inconsistent and conflict with one another. In addition, the policy does not give any formal recognition to the management burden and staffing needs of project offices when component breakout is pursued.

15. Question 15

From your functional area perspective, what do you consider to be the advantages and disadvantages of component breakout?

Interpretation and Analysis of Responses

The responses to this question were surprisingly consistent among all respondents. One-hundred percent stated that cost savings was the primary advantage of component breakout. One-hundred percent indicated that increased management burden was the primary disadvantage of component breakout.

The data indicate that cost savings is a major criterion in deciding whether to pursue component breakout. However, the effort required to achieve this potential cost saving should also be factored into the decision making process. The data indicate that the primary disadvantage of component breakout is the increased management burden placed on the program manager. A decision to pursue component breakout should therefore be contingent on the increased staffing levels required to manage the component being broken out.

E. SUMMARY

This chapter presented and analyzed the data obtained from the questionnaire. This chapter has demonstrated through data analysis that the component breakout process is a challenging endeavor for a number of reasons. The component breakout decision must be made from a macro perspective with the total program in mind in order to ensure overall program success. A number of factors were identified that can affect a project office's ability to effectively implement a successful component breakout program. In addition, the primary advantages and disadvantages of component breakout from the TOW Project Office's perspective were identified. The environment in which the component breakout program operates was also explored.

V. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL

The purpose of this chapter is to answer the thesis primary and subsidiary research questions and present conclusions and recommendations resulting from the data. In addition, areas for further research are provided. Conclusions and recommendations are based on the literature review, interviews conducted, questionnaires, and analysis results.

B. CONCLUSIONS

1. Component Breakout is Resisted by Program Managers

Program managers are reluctant to implement a breakout strategy because of the increased cost, schedule and performance risks to their programs. This opposition is largely based upon past problems with managing GFE. In looking at the disadvantages of breaking out components presented in this thesis, it is not hard to see why program managers are adverse to component breakout. Component breakout significantly increases program risk and demands a considerable amount of time from project office personnel.

2. Component Breakout Operates in an Environment of Competing Requirements and Interests

A major goal of breakout is to reduce the acquisition cost of components. However, this goal has to be balanced against program risk. The project office's goal is to field a supportable system on time within budget that meets all performance requirements. This goal is often incompatible with the goal of the various socio-economic concerns of the SBA. In fact, these two goals often collide head on. The victim of this situation is the soldier in

the field whose life may depend upon the system. A balance of these competing priorities is necessary in order to satisfy the needs of the user.

3. Component Breakout Policy and Guidance is Sufficient

The policy and guidance within the DOD is more than adequate. The DFARS clearly delineates the process to follow when deciding on whether or not to breakout a component. The questions listed in the DFARS and included in Chapter III of this thesis are an excellent guideline for the program manager to utilize when evaluating the feasibility or desirability of breaking out a component.

4. Component Breakout is Going to be Increasingly Difficult to Accomplish in the Future

In the current acquisition environment, breakout is becoming more and more challenging. As prime contractors fight to maintain their business base, they are keeping much of their subcontracting efforts in-house to off-set the reduction in defense spending. This trend is likely to continue in the future.

C. RECOMMENDATIONS

1. Ensure that the Component Breakout Strategy is Included in the Acquisition Strategy

The planning for component breakout should start early in the acquisition life cycle and not be an afterthought. Issues such as life cycle cost and technical data rights need to be considered early in the planning stages. All functional areas in the project office should provide input into the acquisition plan and identify high risk areas that should be considered in order to make a cost effective decision with respect to component breakout.

2. Require a Risk Analysis Prior to All Breakout Decisions

Risk is inherent to the breakout process. However, many of these risks can be identified and mitigated if a comprehensive risk analysis is performed. This will allow the program manager to make an informed decision on whether to pursue component breakout as an acquisition strategy for his program.

3. Determine and Fund the Additional Personnel Resources Required When Performing Component Break-out

Component breakout is a manpower intensive requirement. If breakout is going to be chosen as an acquisition strategy, the manpower required to effectively manage the breakout process should be planned and budgeted for. This is a serious problem that must be considered when a component is broken out. Failure to consider this aspect of component breakout can compound the issues discussed in this thesis.

4. Conduct a Cost-Benefit Analysis Prior to Making a Component Breakout Decision

Component breakout can be a complex process depending on the situation. In certain situations, component breakout can and does work. In making a decision to breakout a component, the costs and benefits must be examined. The advantages and disadvantages identified in this thesis are variables that the program manager and contracting personnel must assess in determining the potential costs and benefits for each situation. All too often, the Government looks for short run savings because of the immediate pressures to cut costs. This short term perspective can have a significant impact on future costs. The initial acquisition cost of an item is a small portion of the overall life-cycle cost. Although DOD is to consider life-cycle cost when acquiring a weapon system, these costs often take a back

seat to immediate savings. A cost-benefit analysis should be performed on components that are being considered for breakout.

D. ANSWERS TO RESEARCH QUESTIONS

1. Subsidiary Question #1. What are the current regulations, statutes, and other guidance pertaining to the component breakout program?

There are numerous regulations, statutes, and guidance that impact the component breakout process. The primary policy document for the component breakout program is the DFARS. The Small Business and Federal Procurement Competition Enhancement Act implemented in 1984 is the primary legislative mandate that impacts the component breakout program. There are also many commands that have internal operating instructions on implementing component breakout. The regulations, statutes, and policies pertaining to component breakout continue to evolve as new policy is being promulgated within DOD.

2. Subsidiary Question #2. What are the current requirements for component breakout and how is the TOW project office implementing those requirements?

A component breakout decision is required when substantial cost savings is possible and the component breakout decision will not impact the quality, reliability, or timely delivery of an end item. The DFARS contains 12 breakout guidelines to use when making a component breakout decision. The TOW project office follows the 12 breakout guidelines contained in the DFARS as criteria in evaluating each component breakout decision. This involves extensive analysis of each component breakout situation against the criteria contained in the DFARS. In addition, lessons learned from previous component breakout decisions are used to assess each new component breakout decision.

3. Subsidiary Question #3. What are the problems associated with the component breakout process from the project office perspective?

From the project office perspective breakout increases program risk and creates an additional management burden upon project office personnel. Since one of the program manager's primary functions is to reduce program risk, implementing a breakout strategy conflicts with that goal.

The TOW project office has experienced many of these risks first hand. Cost growth, termination for default, defective and late GFE are a few examples of some of the common problems the TOW project office had to contend with when pursuing component breakout.

4. Subsidiary Question #4. Does component breakout still make sense for the TOW project office in a declining business base?

In the past, component breakout was often justified because of large production runs and the potential for savings. However, given the shrinking industrial base and the fact that the TOW project office is nearing the end of the production phase and procuring much smaller quantities, the potential for cost savings is diminishing.

5. Primary Research Question. Based on the current draw-down, and cutbacks in defense appropriations and in the number of weapon systems, along with a shrinking industrial base, do the disadvantages of component breakout outweigh the advantages of component breakout, and is component breakout still a feasible and/or desirable cost reduction strategy for the TOW project office?

The disadvantages associated with implementing component breakout for the TOW missile system in today's environment far outweigh the advantages. In the current defense environment, the potential savings for the TOW project office are lessened by the reduced quantities being procured as the TOW missile system nears the end of its production cycle.

This coupled with the additional risks associated with implementing a component breakout program makes pursuing component breakout an undesirable cost reduction strategy for the TOW project office now and into the foreseeable future.

E. AREAS FOR FURTHER RESEARCH

An area for further research is to develop a cost benefit model for program managers to use in assessing the desirability of component breakout. Another area of potential research is to survey contractors that have performed component breakout to solicit their perspective on the component breakout process and compare that to the Government's perspective.

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APPENDIX. QUESTIONNAIRE

1. Are there certain systems or components that have been easier to breakout than others?

2. What process does the project office use to assess the desirability/feasibility of breaking out a component?

3. What criteria are used to determine if a component should be broken out?

4. What is the most difficult aspect of the breakout process from the project office perspective? How does the project office overcome these difficulties?

5. What external agencies does the project office have to deal with when breaking out components? What are the main difficulties when working with these agencies?

6. Has the project office implemented any unique breakout techniques that have enhanced the breakout process? If so, please specify what they are.

7. Is the breakout process becoming more difficult or easier to accomplish and why?

8. What are the decision variables that you think are key to a successful component breakout (i.e., mature TDP, cost savings, design complexity, technical expertise of personnel, staffing levels etc.)? List the top 10 variables in descending order of importance.

9. What are the positive and negative impacts of component breakout for the project office?

10. Is the project office experiencing an increase or decrease in component breakout? What is the reason for the increase or decrease?

11. Do you think the Competition Advocate and the Small Business Administration is an asset or liability to the project office when it comes to component breakout?

12. From a personnel and technical perspective, is the project office properly staffed to perform the systems integration role required when components are broken out?

13. Who should make the component decision? Should a PM ever be forced to breakout a component? If so, by whom?

14. Do you think there is adequate policy guidance within the DOD, DA, and/or the project office concerning component breakout?

15. From your functional area perspective, what do you consider to be the advantages and disadvantages of component breakout?

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